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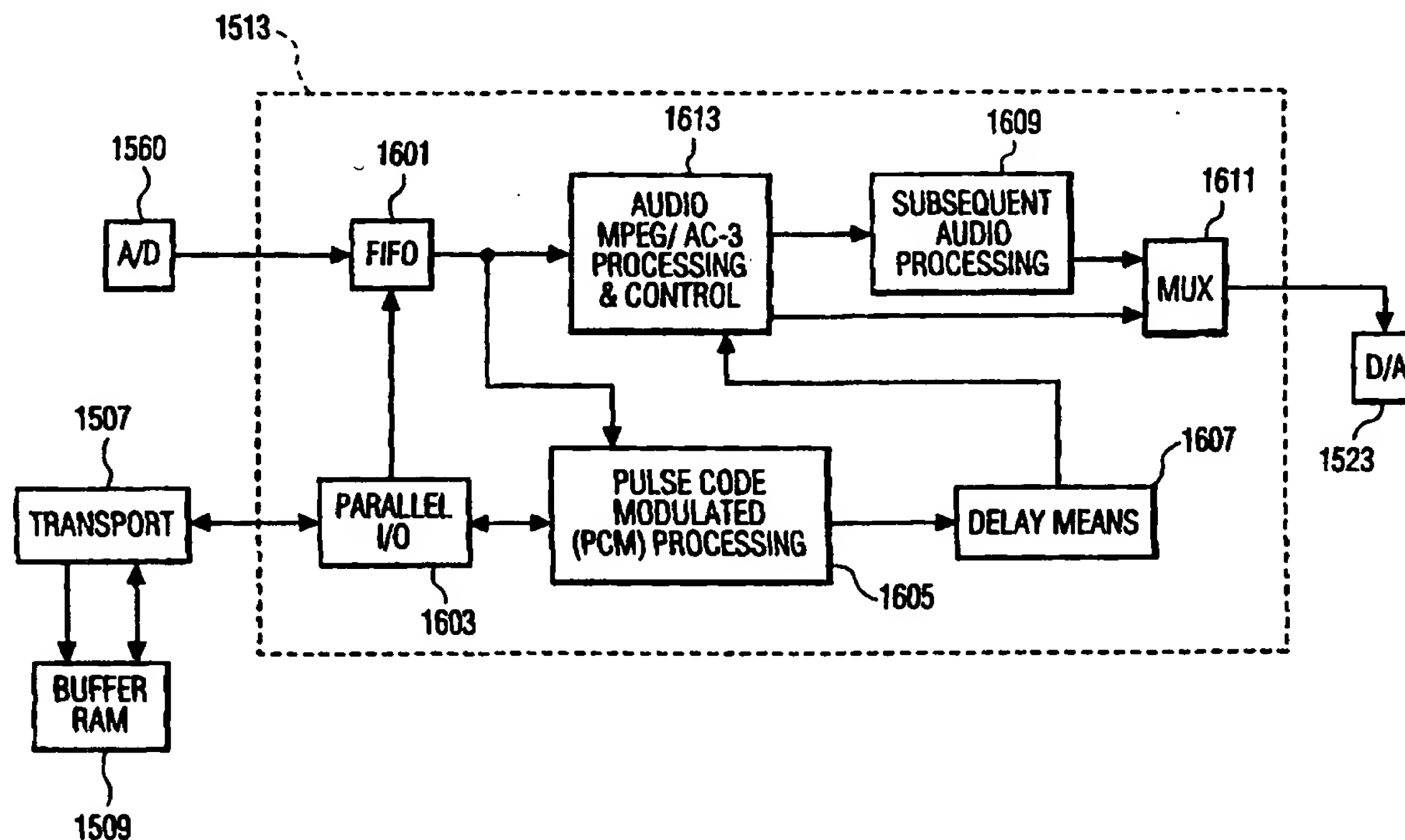
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(54) Title: APPARATUS FOR PROVIDING A VIDEO LIP SYNC DELAY AND METHOD THEREFORE



(57) Abstract

A digital receiver for processing one of a packetized input data stream and a digitized standard definition input signal provides a delay in the processing of the standard definition audio input signal to maintain synchronism with the processing of a corresponding standard definition video signal.

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**APPARATUS FOR PROVIDING A VIDEO LIP SYNC DELAY
AND METHOD THEREFORE**

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Field of the Invention

The invention concerns an apparatus for providing a delay of a standard definition television ("SDTV") (e.g., NTSC, PAL or SECAM) audio signal to maintain proper synchronization of the video image and the audio output. The invention is especially well suited for use in a high definition television ("HDTV") system.

Background of the Invention

15 Typical consumer electronic products, such as televisions and VCRs are known to be configured to receive standard definition signals (such as NTSC, PAL or SECAM). However, it is recognized that the emerging digital consumer electronic products must be configured to receive both digital streams and standard definition signals. Digital
20 receivers are designed to receive television information in the form of a stream of digital packets representing video and audio information in compressed form in accordance with a predetermined digital compression standard. For example, the MPEG video and audio compression standards may be employed. The MPEG video and audio
25 compression standards are international standards for the coded representation of and audio information developed by the Motion Pictures Expert Group.

Summary of the Invention

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The present invention resides in part in the recognition that a high definition digital receiver (e.g., HDTV) configured to receive SDTV signals is subject to displaying a video image that is not in synchronization with the audible output and in part with the
35 apparatus to maintain synchronization.

In accordance with one aspect of the present invention, a receiver apparatus comprises means for receiving a packetized input data

stream; means for receiving a digitized audio signal and a digitized video signal; and means for partitioning said packetized data stream to generate a video component and an audio component. Further, the apparatus comprises a first and second means for digital signal processing to generate, respectively, a decompressed video output signal in response to one of said video component of said packetized data stream and said digitized video signal and a decompressed audio output signal in response to one of said audio component of said packetized data stream and said digitized audio signal. Still further, the apparatus comprises a means for transposing said video output signal to a displayable video signal and said audio output signal to an audible output signal.

In accordance with another aspect of the present invention, the receiver apparatus further comprises an adjustable means for delaying said output audio signal to be in synchronism with said displayable video signal.

In accordance with yet another aspect of the present invention, the adjustable delaying means comprises an adjustable memory device and may be connected to one of the second processing means or the partitioning means. The second processing means further comprises means for secondary audio processing., such as surround sound processing.

In accordance with a method aspect of the present invention, there is provided a method for processing an input signal comprising; receiving one of a packetized input data stream and a digitized signal comprised of a digitized video signal and a digitized audio signal; partitioning one of said packetized data stream to generate a video component and an audio component; converting said digitized video signal into a progressive scan format; processing one of said packetized data stream and said digitized input signal to generate a decompressed video and audio output signal; and transposing said video output signal to a displayable video signal and said audio output signal to an audible output signal.

In accordance with another method aspect of the present invention, the method for processing an input signal further comprises delaying said audio output signal to be in synchronism with said displayable video signal. The step of delaying comprises providing said audio
5 output signal to an adjustable memory device or to a secondary processor.

These and other aspects of the invention will be described with respect to the accompanying Drawings.

10

Brief Description of the Drawing

Figure 1 is a simplified schematic block diagram of a digital receiver including apparatus constructed in accordance with
15 an exemplary embodiment of the present invention; and

Figure 2 is a simplified schematic block diagram of the audio MPEG/AC-3 decoder of Figure 1.

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Detailed Description of the Drawing

Digital receiver 15 tunes, demodulates and otherwise processes the received television signal as will be described in detail below to produce displayable video images on a conventional display device
25 and audible signals on conventional speakers in response to received television information.

The apparatus shown in Figure 1 is a digital receiver 15, such as, for example, one that may be employed in a high definition television
30 ("HDTV"). Particularly, the television information is received in either (1) compressed form in accordance with a predetermined digital compression standard (for example, the MPEG video and audio compression standards) or (2) SDTV analog signal (for example, NTSC, PAL or SECAM). The MPEG video and audio compression standards
35 are international standards for the coded representation of and audio information developed by the Motion Pictures Expert Group.

The digital video and audio signals are compressed and encoded according to the MPEG video and audio compression and encoding standards to form respective series or streams of data packets. The video and audio packets are multiplexed to form a stream of packets for transmission. Each packet of the transmission stream includes a data or "payload" portion and a header portion which identifies the type of information represented by the payload portion of the packet. Packets corresponding to control and other data may also be added to the transmission stream.

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Forward error correction (FEC) data is added to the packets in order to make the correction of errors due to noise within the transmission path possible. The well known Viterbi and Reed-Solomon types of forward error correction coding may both be advantageously employed. The digital information resulting from the compression, encoding and error correction operations is modulated on a carrier in what is known in the digital transmission field as QPSK (Quadrature Phase Shift Keying) modulation.

15

Digital receiver 15 includes both a HD/NTSC tuner 1500 and a DSS tuner 1501, both having a local oscillator and mixer (not shown) for selecting the appropriate carrier signal from the plurality of received signals and for converting the frequency of the selected carrier to a lower frequency to produce an intermediate frequency (IF) signal. Further HD/NTSC tuner 1500 and DSS tuner 1501 demodulate the IF signal.

20

DSS tuner 1501 may include a QPSK demodulator, not shown, to produce a demodulated digital signal and a FEC decoder, not shown, to decode the error correction data contained in the demodulated digital signal, and based on the error correction data corrects the demodulated packets representing video, audio and other information to produce a stream of error corrected data packets which are provided to link circuitry 1505. The SDTV demodulated signal from HD/NTSC tuner 1500 is further processed in a conventional manner by NTSC processing circuitry 1540. (The details of NTSC processing circuitry 1540 are not required to fully understand the present

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invention.) Whereas, the HD demodulated stream is provided the link circuitry 1505.

5 A MPEG transport decoder unit 1507 cooperates with a buffer memory in the form of a random access memory (RAM) 1509 to route the payload portion of the video packets of the error corrected stream to a video MPEG decoder 1511 and the payload portion of the audio packets to an audio MPEG/AC-3 decoder 1513 via a data bus or separate lines according to the header information contained in the
10 packets. RAM 1509 is used to temporarily store packets of the data stream of the transmitted signal in respective memory locations in accordance with the type of information which they represent.

Transport unit 1507 is a memory manager for buffer RAM 1509 which demultiplexes the data packets of the error corrected stream
15 and routes the payload portions of the packets to respective memory locations according to the header portions of the respective packets. The contents of the video and audio sections of RAM 1509 are read out and transferred to video MPEG decoder 1511 and audio MPEG/AC-3 decoder 1513, respectively, on demand in response to
20 requests from these units. Details of the construction of transport 1507 and buffer RAM 1509 are not required to understand the present invention, but may be found in US patent application serial number 232,789, entitled "A Packet Video Signal Inverse Transport System" filed for M. S. Deiss on April 22, 1994.

25 Video MPEG decoder 1511 interfaces with a dynamic random access memory (DRAM) 1515 to decode and decompress the payload portion of the video packets to form a stream or sequence of digital words representing video information in component form. For example, the
30 components may correspond to a luminance (Y) component and two color difference (Cr and Cb) components. Further, video MPEG decoder 1511 has a separate input to receive a digitized SDTV video signal from analog-to-digital converter ("A/D") 1550. (Details of the construction of video MPEG decoder is not required to understand the
35 present invention.) Video decoding and decompression integrated circuits (ICs) are commercially available. For example, a MPEG decoding and decompression IC, identified by part number ST3240, is available from SGS Thomson, of France.

The luminance and chrominance representative digital words are converted to analog luminance and chrominance signals by respective sections of a digital-to-analog converter (DAC) 1519.

5 These analog luminance and chrominance signals are coupled to "2H" video processing circuitry 1529 which converts the component representative digital words to three separate video signals; R, G and B. These video signals are provided to a display device 1531. (Details of the construction of the well known "2H" video processing circuitry and display device are not required to understand the present invention.)

Audio MPEG/AC-3 decoder 1513 interfaces with dynamic random access memory (DRAM) 1521 to decode and decompress the payload portion of the audio packets to produce a sequences of digital words representing "left" (L) and "right" (R) audio information. As is well known in the art, memory 1521 may optionally be integral with audio MPEG/AC-3 decoder 1513. Further, decoder 1513 has a separate input to receive a digitized standard definition audio signal (explained in detail below in connection with Figure 2a). Audio decoding and decompression ICs are commercially available. For example, a MPEG audio decoding and decompression IC, identified by part number DSP56011, is available from Motorola. The sequences of audio representative digital words are converted to baseband analog left and right audio signals by respective sections of DAC 1523 and audio processing circuitry 1525. Although only two audio channels are shown in the Figure, it will be appreciated that in practice, one or more additional audio channels, for example, for "surround sound" reproduction, may be provided.

30 The baseband analog video and audio signals are coupled to speakers 1527, which may be integral with display device 1531 via respective baseband connections. The baseband analog video and audio signals may also be coupled to a modulator (not shown) which modulates the analog signals on to a radio frequency (RF) carrier in accordance with a conventional television standard such as NTSC, PAL or SECAM for coupling to the antenna input of a display device without baseband inputs.

A microprocessor 1527 provides frequency selection control data to HD/NTSC tuner 1500 and DSS tuner 1501 for controlling the operation of the tuner to tune channels selected by the user. Microprocessor 1527 also operates interactively with transport 1507 to affect the routing of payload portions of packets. Microprocessor 1527 additionally provides control data to video MPEG decoder 1511 and audio decoder 1513 via a control bus. Microprocessor 1527 operates in response to a control program stored in a "read only" memory (ROM) 1529.

Both video MPEG decoder 1515 and audio MPEG/AC-3 decoder 1513 are configured to receive the digitized video and audio components, respectively, of a SDTV analog input signal. Digitized video and audio components are provided by passing the demodulated and processed analog video and audio components generated by NTSC processing circuitry through analog-to-digital converters 1550 and 1560, respectively. In operation, the digitized video component is processed by the video MPEG decoder and up-converter 1511 and the digitized audio component is processed by audio MPEG/AC-3 decoder 1513. The time to process the digitized video component is greater than the time necessary to process the digitized audio component thereby creating a delay between audio output and the display image.

The apparatus shown in Figure 2 is a simplified schematic block diagram of the audio MPEG/AC-3 decoder 1513 discussed above. As described above, decoder 1513 generates digital words which represent the audio information in response to either a digitized SDTV audio signal produced by A/D 1560 or the audio portion of the input stream produced by MPEG transport decoder unit 1507 and RAM 1509. The details of audio MPEG/AC-3 decoder 1513 will be discussed in terms of its functional operation and signal flow path. The audio portion of the input MPEG stream is supplied to decoder 1513 through parallel input/output 1603. The input stream is provided to FIFO memory means 1601 for initial processing and formatting. Audio MPEG/AC-3 Processing circuitry 1613 processes the input stream to produce sequences of digital words representing the audio information. Additional audio processing, such as surround

sound processing, may be performed by subsequent audio processing means 1609 to produce further processed audio information. A control signal (not shown) is provided multiplexer ("MUX") 1611 to select between the audio information generated by processing and control circuitry 1613 and the further processed audio information generated by subsequent audio processing means 1609.

Audio MPEG/AC-3 decoder 1513 is configured to generate audio information in response to a digitized SDTV audio input signal received from A/D 1560 as described above. FIFO memory means 1601 formats the digitized audio input signal prior to it being provided to pulse code modulated circuitry 1605. As discussed above, the time to process the digitized SDTV audio input signal is less than the time necessary to process the corresponding digitized video signal thereby necessitating the insertion of a delay in the audio processing to maintain synchronization between these two signals. The PCM processed audio input signal is provided to delay means 1607. Delay means 1607 may be a portion of the general memory 1521 associated with the audio MPEG/AC-3 decoder 1513. The delayed audio input signal is provided to the control portion of audio MPEG/AC-3 processing circuitry 1613 and may either be supplied directly to MUX 1611 or to subsequent audio processing means 1609 as described above prior to being supplied to D/A 1523.

Alternately, the PCM processed audio signal may be provided to transport unit 1507 and RAM 1509 through parallel I/O 1603 for delay processing. Specifically, RAM 1509 will be used to achieve the delay accomplished by delay means 1607 as described above.

While the present invention has been described in terms of a specific embodiment, it will be appreciated that modifications may be made. These and other modifications are contemplated to be within the scope of the invention defined by the following claims.

CLAIMS

- 5 1. A receiver comprising:
- (a) means for receiving a packetized input data stream comprised of multiplexed and compressed packets, each of said packets having at least header and payload data;
- 10 (b) means for receiving a digitized audio signal and a digitized video signal;
- (c) means for partitioning said packetized data stream to generate a video component and an audio component;
- 15 (d) first means for digital signal processing to generate a decompressed video output signal in response to one of said video component of said packetized data stream and said digitized video signal;
- (e) second means for digital signal processing to generate a decompressed audio output signal in response to one of said audio component of said packetized data stream and said digitized audio
- 20 signal; and
- (f) means for transposing said video output signal to a displayable video signal and said audio output signal to an audible output signal.
- 25 2. The receiver of claim 1 further comprising an adjustable means for delaying said output audio signal to be in synchronism with said displayable video signal.
- 30 3. The receiver of claim 2 wherein said adjustable delaying means comprises an adjustable memory device.
4. The receiver of claim 3 wherein said delaying means is connected to said second processing means.
- 35 5. The receiver of claim 3 wherein said delaying means is connected to said partitioning means.

6. The receiver of claim 4 or claim 5 wherein said second processing means further comprises means for secondary audio processing.

5 7. The receiver of claim 6 wherein said secondary audio processing means comprises means for surround sound processing.

8. The receiver of claim 1 or claim 7 wherein said first processing means comprises a means for converting said digitized video signal
10 having an interlace video format into a digitized video signal having a progressive scan format.

9. A method for processing an input signal having a video component and an audio component, said method comprising:

15 (a) receiving one of a packetized input data stream and a digitized signal comprised of a digitized video signal and a digitized audio signal;

(b) partitioning one of said packetized data stream to generate a video component and an audio component;

20 (c) converting said digitized video signal into a progressive scan format;

(d) processing one of said video component of said packetized data stream and said digitized video signal to generate a decompressed video output signal;

25 (e) processing one of said audio component of said packetized data stream and said digitized audio signal to generate a decompressed audio output signal,

(f) transposing said video output signal to a displayable video signal and said audio output signal to an audible output signal.

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10. The method of claim 9 further comprising delaying said audio output signal to be in synchronism with said displayable video signal.

11. The method of claim 10 wherein the step of delaying comprises
35 providing said audio output signal to an adjustable memory device.

12. The method of claim 11 further comprising the step of providing said audio output signal to a secondary processor.

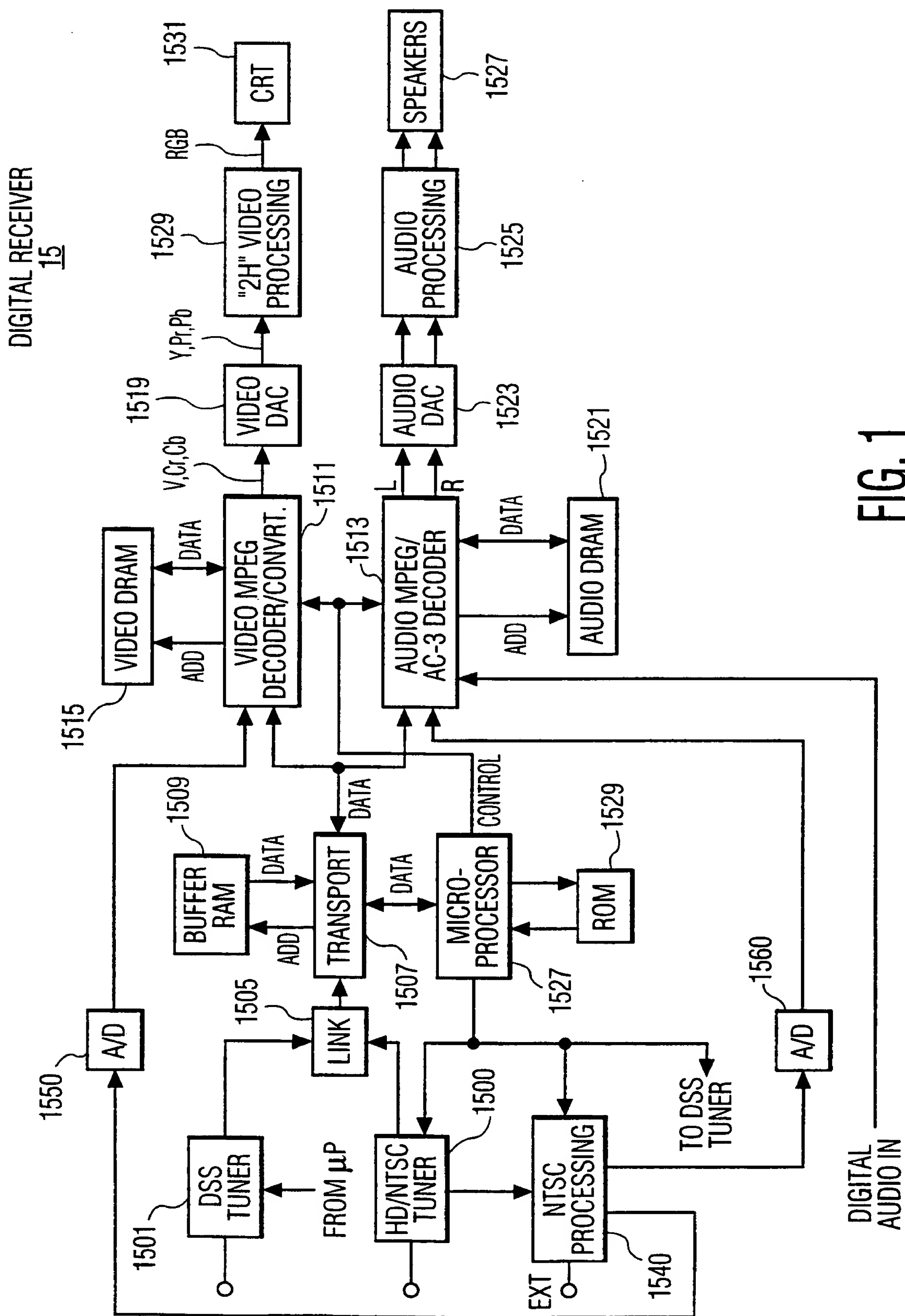


FIG. 1

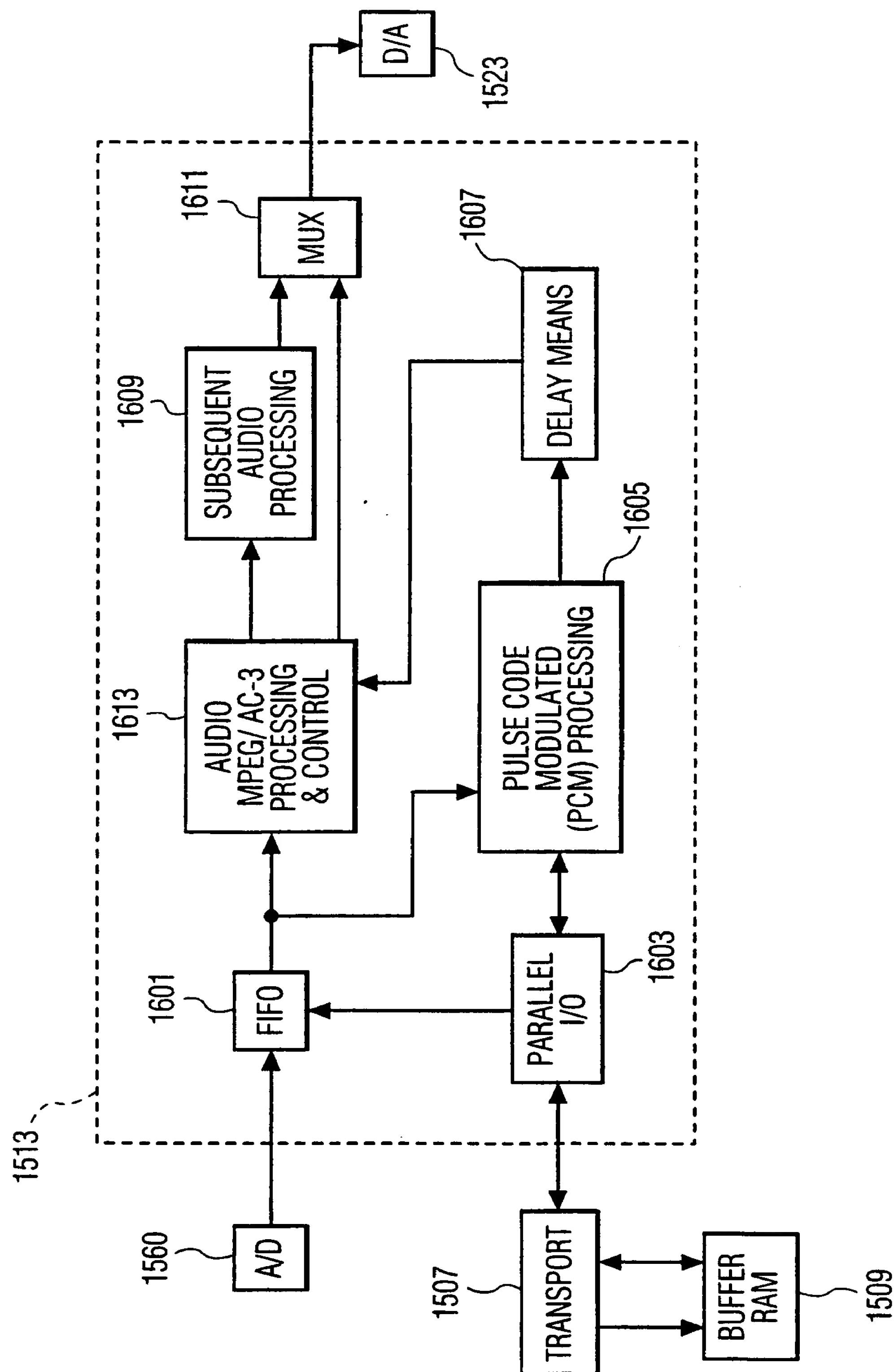


FIG. 2

INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 99/00315

A. CLASSIFICATION OF SUBJECT MATTER

IPC 6 H04N5/04 H04N5/44 H04N5/60 H04N7/52

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 H04N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0 766 462 A (SAMSUNG ELECTRONICS CO LTD) 2 April 1997	1,9
Y	see page 2, line 13 - page 3, line 23 see column 16, line 5 - column 17, line 11; figure 8	2,3,6-8, 10-12
Y	EP 0 776 134 A (GEN INSTRUMENT CORP) 28 May 1997 see abstract	2,3,10, 11
Y	EP 0 598 295 A (MATSUSHITA ELECTRIC IND CO LTD) 25 May 1994 see abstract	2,3,10, 11
	-/-	

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance
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Date of the actual completion of the international search

28 April 1999

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06/05/1999

Name and mailing address of the ISA

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INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 99/00315

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	PATENT ABSTRACTS OF JAPAN vol. 013, no. 410 (E-819), 11 September 1989 & JP 01 149582 A (VICTOR CO OF JAPAN LTD), 12 June 1989 see abstract ---	2,3,10, 11
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INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 99/00315

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		DE 69321558 T	22-04-1999
		US 5351090 A	27-09-1994

PATENT COOPERATION TREATY

PCT

NOTIFICATION OF ELECTION

(PCT Rule 61.2)

From the INTERNATIONAL BUREAU

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Date of mailing (day/month/year) 02 September 1999 (02.09.99)	
International application No. PCT/US99/00315	Applicant's or agent's file reference RCA 88853
International filing date (day/month/year) 07 January 1999 (07.01.99)	Priority date (day/month/year) 07 January 1998 (07.01.98)
Applicant DEISS, Michael, Scott et al	

1. The designated Office is hereby notified of its election made:

☒ in the demand filed with the International Preliminary Examining Authority on:
04 August 1999 (04.08.99)

☐ in a notice effecting later election filed with the International Bureau on:

2. The election ☒ was
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made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 99/00315

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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TENT COOPERATION TREATY

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INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference RCA 88853	FOR FURTHER ACTION see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.	
International application No. PCT/US 99/ 00315	International filing date (day/month/year) 07/01/1999	(Earliest) Priority Date (day/month/year) 07/01/1998
Applicant THOMSON CONSUMER ELECTRONICS, INC. et al.		

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 3 sheets.
☒ It is also accompanied by a copy of each prior art document cited in this report.

1. Basis of the report

- a. With regard to the **language**, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.
- ☐ the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).
- b. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international search was carried out on the basis of the sequence listing :
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- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

2. ☐ **Certain claims were found unsearchable** (See Box I).
3. ☐ **Unity of invention is lacking** (see Box II).

4. With regard to the title,

- ☒ the text is approved as submitted by the applicant.
- ☐ the text has been established by this Authority to read as follows:

5. With regard to the abstract,

- ☒ the text is approved as submitted by the applicant.
- ☐ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the drawings to be published with the abstract is Figure No.

- ☒ as suggested by the applicant. 2
- ☐ because the applicant failed to suggest a figure. ☐ None of the figures.
- ☐ because this figure better characterizes the invention.

INTERNATIONAL SEARCH REPORT

International Application No

/US 99/00315

A. CLASSIFICATION OF SUBJECT MATTER

IPC 6 H04N5/04 H04N5/44 H04N5/60 H04N7/52

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 H04N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0 766 462 A (SAMSUNG ELECTRONICS CO LTD) 2 April 1997	1,9
Y	see page 2, line 13 - page 3, line 23 see column 16, line 5 - column 17, line 11; figure 8	2,3,6-8, 10-12
Y	--- EP 0 776 134 A (GEN INSTRUMENT CORP) 28 May 1997 see abstract	2,3,10, 11
Y	--- EP 0 598 295 A (MATSUSHITA ELECTRIC IND CO LTD) 25 May 1994 see abstract --- -/--	2,3,10, 11

☒ Further documents are listed in the continuation of box C.☒ Patent family members are listed in annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search

28 April 1999

Date of mailing of the international search report

06/05/1999

Name and mailing address of the ISA

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Authorized officer

Yvonnet, J

INTERNATIONAL SEARCH REPORT

International Application No

/US 99/00315

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	PATENT ABSTRACTS OF JAPAN vol. 013, no. 410 (E-819), 11 September 1989 & JP 01 149582 A (VICTOR CO OF JAPAN LTD), 12 June 1989 see abstract ---	2,3,10, 11
Y	PATENT ABSTRACTS OF JAPAN vol. 007, no. 264 (E-212), 24 November 1983 & JP 58 146181 A (NIPPON HOSO KYOKAI), 31 August 1983 see abstract ---	2,3,10, 11
Y	PATENT ABSTRACTS OF JAPAN vol. 013, no. 374 (E-808), 18 August 1989 & JP 01 126894 A (SONY CORP), 18 May 1989 see abstract ---	2,10
Y	PATENT ABSTRACTS OF JAPAN vol. 096, no. 008, 30 August 1996 & JP 08 102911 A (SONY CORP), 16 April 1996 see abstract ---	2,10
Y	PATENT ABSTRACTS OF JAPAN vol. 016, no. 344 (E-1239), 24 July 1992 & JP 04 104673 A (FUJITSU GENERAL LTD), 7 April 1992 see abstract ---	6,7,12
Y	PATENT ABSTRACTS OF JAPAN vol. 016, no. 031 (E-1159), 27 January 1992 & JP 03 243083 A (FUJITSU GENERAL LTD), 30 October 1991 see abstract -----	8

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

US 99/00315

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 0766462 A	02-04-1997	CN 1151656 A JP 9130697 A	11-06-1997 16-05-1997
EP 0776134 A	28-05-1997	US 5703877 A BR 9605667 A CA 2190688 A CN 1160328 A	30-12-1997 18-08-1998 23-05-1997 24-09-1997
EP 0598295 A	25-05-1994	JP 6303552 A JP 6303585 A JP 6165078 A CA 2102928 A,C DE 69321558 D DE 69321558 T US 5351090 A	28-10-1994 28-10-1994 10-06-1994 18-05-1994 19-11-1998 22-04-1999 27-09-1994

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PATENT COOPERATION TREATY

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INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference RCA 88853	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/US99/00315	International filing date (day/month/year) 07/01/1999	Priority date (day/month/year) 07/01/1998
International Patent Classification (IPC) or national classification and IPC H04N5/04		
Applicant THOMSON CONSUMER ELECTRONICS, INC. et al.		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 4 sheets, including this cover sheet.

- ☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of 4 sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☐ Certain defects in the international application
- VIII ☐ Certain observations on the international application

Date of submission of the demand

04/08/1999

Date of completion of this report

30.05.2000

Name and mailing address of the international preliminary examining authority:



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**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. PCT/US99/00315

I. Basis of the report

1. This report has been drawn on the basis of (*substitute sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to the report since they do not contain amendments.*):

Description, pages:

2-8 as originally filed

1,1a as received on 05/05/2000 with letter of 05/05/2000

Claims, No.:

1-10 as received on 05/05/2000 with letter of 05/05/2000

Drawings, sheets:

1/2,2/2 as originally filed

2. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
☒ the claims, Nos.: 11,12
☐ the drawings, sheets:

3. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

4. Additional observations, if necessary:

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. PCT/US99/00315

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	1-10
	No:	Claims	
Inventive step (IS)	Yes:	Claims	1-10
	No:	Claims	
Industrial applicability (IA)	Yes:	Claims	1-10
	No:	Claims	

2. Citations and explanations

see separate sheet

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/US99/00315

Ad section V:

Independent claims:

The general technical field of the application is the field of television receivers, in particular, but not exclusively of receivers for processing the television information in form of a stream of digital packets representing video and audio information in a compressed form.

The closest prior document cited in the international search report is considered to be D1, EP-A-0 766 462. This document reveals a system for receiving both analogue and digital video within one receiver. Said receiver is able to digitally process analogue TV signal so that a common circuitry for the analogue and digital modes is used in some stages of processing. Said common circuitry amounts to a memory and a corresponding memory controller.

In contrast, present application describes and claims a receiver and a corresponding method, in which the input signals are either in a digital, multiplexed and compressed form or digitized audio and video. A common video processing means handles, according to its nature, one of the signals at the input to generate a video output signal. Similarly, a common audio processing unit either decompresses the compressed audio or processes a digitized audio signal in order to provide an audio output. In addition, in order to cope with different delays involved with the video processing in the video processing means according to the nature of the signal - compressed or not-, the processing of the audio signal is selectively delayed so that the audio and video outputs are in synchronism (lip sync).

The subject matter of the independent claims is therefore considered to be both inventive (Article 33(3) PCT) and novel (Article 33(2) PCT) over the cited prior art as the defined receiver is not made obvious by the cited prior art.

Dependent claims:

Considering the teachings of cited prior art documents, the preferred embodiments recited in the dependent claims are new and involve an inventive step.

Industrial applicability:

It cannot be questioned that the defined receiver has an industrial applicability (Article 33(1) PCT).

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**APPARATUS FOR PROVIDING A VIDEO LIP SYNC DELAY
AND METHOD THEREFORE**

5 **Field of the Invention**

The invention concerns an apparatus for providing a delay of a standard definition television ('SDTV') (e.g., NTSC, PAL or SECAM) audio signal to maintain proper synchronization of the video image and
10 the audio output. The invention is especially well suited for use in a high definition television ("HDTV") system.

Background of the Invention

15 Typical consumer electronic products, such as televisions and VCRs are known to be configured to receive standard definition signals (such as NTSC, PAL or SECAM). However, it is recognized that the emerging digital consumer electronic products must be configured to receive both digital streams and standard definition signals. Digital
20 receivers are designed to receive television information in the form of a stream of digital packets representing video and audio information in compressed form in accordance with a predetermined digital compression standard. For example, the MPEG video and audio compression standards may be employed. The MPEG video and audio
25 compression standards are international standards for the coded representation of and audio information developed by the Motion Pictures Expert Group.

30 EP-A-0 766 462 discloses a receiver having both an analog service mode and a digital video mode. When the analog video mode is selected according to a mode selection signal indicating that a television channel is for the analog video mode or the digital video mode, a large-capacity memory used for the digital video-decoding may also be used as a frame memory for Y/C separation and post-
35 processing, for enhancing picture quality, improving the efficiency of the memory and reducing the cost of a system.

Summary of the Invention

40 The present invention resides in part in the recognition that a high definition digital receiver (e.g., HDTV) configured to receive SDTV signals is subject to displaying a video image that is not in

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synchronization with the audible output and in part with the apparatus to maintain synchronization.

5

In accordance with one aspect of the present invention, a receiver apparatus comprises means for receiving a packetized input data

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CLAIMS

- 5 1. A receiver comprising:
- (a) means (1500, 1501) for receiving a packetized input data stream comprising multiplexed and compressed packets, each of said packets having at least header and payload data;
- (b) means (1500) for receiving an analog signal;
- 10 (c) means (1507, 1509) for partitioning said packetized data stream to generate a video component and an audio component;
- (d) means (1540, 1550, 1560) for processing said analog signal to generate a digitized audio signal and a digitized video signal;
- (e) first means (1511) for digital signal processing and
- 15 decompressing said video component of said packetized data stream, and for digital signal processing said digitized video signal to generate a video output signal.
- (f) second means (1613) for digital signal processing and decompressing said audio component of said packetized data stream,
- 20 and for digital signal processing said digitized audio signal to generate an audio output signal;
- (g) means (1605, 1607) for selectively delaying the processing of the digitized audio signal to synchronize an audible audio signal with a displayable video signal; and
- 25 (h) means (1519, 1523, 1525, 1529) for transposing said video output signal to the displayable video signal and said audio output signal to the audible audio signal.
- 30 2. The receiver of claim 1 wherein said delaying means (1605, 1607) comprises an adjustable memory device.
3. The receiver of claim 2 wherein said delaying means (1605, 1607) is connected to said second processing means (1613).
- 35 4. The receiver of claim 1 wherein said delaying means (1605, 1607) includes said partitioning means (1507, 1509).
5. The receiver of claim 3 or claim 4 wherein said second processing means (1613) further comprises third means (1609) for
- 40 processing said audio output signal.
6. The receiver of claim 5 wherein said third processing means (1609) comprises means for surround sound processing.

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7. The receiver of claim 1 or claim 7 wherein said first processing means (1511) comprises a means for converting said digitized video signal having an interlace video format into a digitized video signal having a progressive scan format.
8. A method for processing an input signal having a video component and an audio component, said method comprising :
- (a) receiving one of a packetized input data stream;
 - (b) receiving a digitized signal comprised of a digitized video signal and a digitized audio signal;
 - (c) partitioning one of said packetized data stream to generate a video component and an audio component;
 - (d) processing said digitized video signal and said digitized audio signal
 - (e) processing and decompressing said video component of said packetized data stream, and processing said digitized video signal to generate a video output signal;
 - (f) processing and decompressing said audio component of said packetized data stream, and processing said digitized audio signal to generate an audio output signal; and
 - (g) delaying selectively the processing of the digitized audio signal to synchronize an audible audio signal with a displayable video signal;
 - (h) transposing said video output signal to the displayable video signal and said audio output signal to the audible output signal.
9. The method of claim 8 wherein the step of delaying comprises providing said audible audio signal to an adjustable memory device.
10. The method of claim 9 further comprising the step of providing said audio output signal to a secondary audio processor (1609).

#5
3/16/01
JCFrom the
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

Confirmation of Fax

PCT

To:

TRIPOLI, J. et al.
THOMSON MULTIMEDIA LICENSING INC.
P.O. Box 5312
Princeton, New Jersey 08543
ETATS-UNIS D'AMERIQUE
HCNOTIFICATION OF TRANSMITTAL OF
THE INTERNATIONAL PRELIMINARY
EXAMINATION REPORT
(PCT Rule 71.1)Date of mailing
(day/month/year) 30.05.2000Applicant's or agent's file reference
RCA 88853

IMPORTANT NOTIFICATION

International application No.
PCT/US99/00315International filing date (day/month/year)
07/01/1999Priority date (day/month/year)
07/01/1998Applicant
THOMSON CONSUMER ELECTRONICS, INC. et al.

1. The applicant is hereby notified that this International Preliminary Examining Authority transmits herewith the international preliminary examination report and its annexes, if any, established on the international application.
2. A copy of the report and its annexes, if any, is being transmitted to the International Bureau for communication to all the elected Offices.
3. Where required by any of the elected Offices, the International Bureau will prepare an English translation of the report (but not of any annexes) and will transmit such translation to those Offices.

4. REMINDER

The applicant must enter the national phase before each elected Office by performing certain acts (filing translations and paying national fees) within 30 months from the priority date (or later in some Offices) (Article 39(1)) (see also the reminder sent by the International Bureau with Form PCT/IB/301).

Where a translation of the international application must be furnished to an elected Office, that translation must contain a translation of any annexes to the international preliminary examination report. It is the applicant's responsibility to prepare and furnish such translation directly to each elected Office concerned.

For further details on the applicable time limits and requirements of the elected Offices, see Volume II of the PCT Applicant's Guide.

Name and mailing address of the IPEA/



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PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference RCA 88853	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/US99/00315	International filing date (day/month/year) 07/01/1999	Priority date (day/month/year) 07/01/1998
International Patent Classification (IPC) or national classification and IPC H04N5/04		
Applicant THOMSON CONSUMER ELECTRONICS, INC. et al.		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.



2. This REPORT consists of a total of 4 sheets, including this cover sheet.

- ☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of 4 sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☐ Certain defects in the international application
- VIII ☐ Certain observations on the international application

Date of submission of the demand 04/08/1999	Date of completion of this report 30.05.2000
Name and mailing address of the international preliminary examining authority:  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized officer D/L FUENTE DEL ..., P Telephone No. +49 89 2399 8608 

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/US99/00315

I. Basis of the report

1. This report has been drawn on the basis of (*substitute sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to the report since they do not contain amendments.*):

Description, pages:

2-8 as originally filed

1,1a as received on 05/05/2000 with letter of 05/05/2000

Claims, No.:

1-10 as received on 05/05/2000 with letter of 05/05/2000

Drawings, sheets:

1/2,2/2 as originally filed

2. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
☒ the claims, Nos.: 11,12
☐ the drawings, sheets:

3. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

4. Additional observations, if necessary:

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. PCT/US99/00315

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	1-10
	No:	Claims	
Inventive step (IS)	Yes:	Claims	1-10
	No:	Claims	
Industrial applicability (IA)	Yes:	Claims	1-10
	No:	Claims	

2. Citations and explanations

see separate sheet

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/US99/00315

Ad section V:

Independent claims:

The general technical field of the application is the field of television receivers, in particular, but not exclusively of receivers for processing the television information in form of a stream of digital packets representing video and audio information in a compressed form.

The closest prior document cited in the international search report is considered to be D1, EP-A-0 766 462. This document reveals a system for receiving both analogue and digital video within one receiver. Said receiver is able to digitally process analogue TV signal so that a common circuitry for the analogue and digital modes is used in some stages of processing. Said common circuitry amounts to a memory and a corresponding memory controller.

In contrast, present application describes and claims a receiver and a corresponding method, in which the input signals are either in a digital, multiplexed and compressed form or digitized audio and video. A common video processing means handles, according to its nature, one of the signals at the input to generate a video output signal. Similarly, a common audio processing unit either decompresses the compressed audio or processes a digitized audio signal in order to provide an audio output. In addition, in order to cope with different delays involved with the video processing in the video processing means according to the nature of the signal - compressed or not-, the processing of the audio signal is selectively delayed so that the audio and video outputs are in synchronism (lip sync).

The subject matter of the independent claims is therefore considered to be both inventive (Article 33(3) PCT) and novel (Article 33(2) PCT) over the cited prior art as the defined receiver is not made obvious by the cited prior art.

Dependent claims:

Considering the teachings of cited prior art documents, the preferred embodiments recited in the dependent claims are new and involve an inventive step.

Industrial applicability:

It cannot be questioned that the defined receiver has an industrial applicability (Article 33(1) PCT).

RCA 88,853

1 05-05-00

**APPARATUS FOR PROVIDING A VIDEO LIP SYNC DELAY
AND METHOD THEREFORE**

5

Field of the Invention

10

The invention concerns an apparatus for providing a delay of a standard definition television ("SDTV") (e.g., NTSC, PAL or SECAM) audio signal to maintain proper synchronization of the video image and the audio output. The invention is especially well suited for use in a high definition television ("HDTV") system.

Background of the Invention

15

20

25

Typical consumer electronic products, such as televisions and VCRs are known to be configured to receive standard definition signals (such as NTSC, PAL or SECAM). However, it is recognized that the emerging digital consumer electronic products must be configured to receive both digital streams and standard definition signals. Digital receivers are designed to receive television information in the form of a stream of digital packets representing video and audio information in compressed form in accordance with a predetermined digital compression standard. For example, the MPEG video and audio compression standards may be employed. The MPEG video and audio compression standards are international standards for the coded representation of and audio information developed by the Motion Pictures Expert Group.

30

35

EP-A-0 766 462 discloses a receiver having both an analog service mode and a digital video mode. When the analog video mode is selected according to a mode selection signal indicating that a television channel is for the analog video mode or the digital video mode, a large-capacity memory used for the digital video-decoding may also be used as a frame memory for Y/C separation and post-processing, for enhancing picture quality, improving the efficiency of the memory and reducing the cost of a system.

Summary of the Invention

40

The present invention resides in part in the recognition that a high definition digital receiver (e.g., HDTV) configured to receive SDTV signals is subject to displaying a video image that is not in

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synchronization with the audible output and in part with the apparatus to maintain synchronization.

5 In accordance with one aspect of the present invention, a receiver apparatus comprises means for receiving a packetized input data

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CLAIMS

- 5 1. A receiver comprising:
- (a) means (1500, 1501) for receiving a packetized input data stream comprising multiplexed and compressed packets, each of said packets having at least header and payload data;
- (b) means (1500) for receiving an analog signal;
- 10 (c) means (1507, 1509) for partitioning said packetized data stream to generate a video component and an audio component;
- (d) means (1540, 1550, 1560) for processing said analog signal to generate a digitized audio signal and a digitized video signal;
- (e) first means (1511) for digital signal processing and
- 15 decompressing said video component of said packetized data stream, and for digital signal processing said digitized video signal to generate a video output signal.
- (f) second means (1613) for digital signal processing and decompressing said audio component of said packetized data stream,
- 20 and for digital signal processing said digitized audio signal to generate an audio output signal;
- (g) means (1605, 1607) for selectively delaying the processing of the digitized audio signal to synchronize an audible audio signal with a displayable video signal; and
- 25 (h) means (1519, 1523, 1525, 1529) for transposing said video output signal to the displayable video signal and said audio output signal to the audible audio signal.
2. The receiver of claim 1 wherein said delaying means (1605, 1607) comprises an adjustable memory device.
- 30 3. The receiver of claim 2 wherein said delaying means (1605, 1607) is connected to said second processing means (1613).
- 35 4. The receiver of claim 1 wherein said delaying means (1605, 1607) includes said partitioning means (1507, 1509).
5. The receiver of claim 3 or claim 4 wherein said second processing means (1613) further comprises third means (1609) for
- 40 processing said audio output signal.
6. The receiver of claim 5 wherein said third processing means (1609) comprises means for surround sound processing.

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5 7. The receiver of claim 1 or claim 7 wherein said first processing means (1511) comprises a means for converting said digitized video signal having an interlace video format into a digitized video signal having a progressive scan format.

10 8. A method for processing an input signal having a video component and an audio component, said method comprising :
 (a) receiving one of a packetized input data stream;
 (b) receiving a digitized signal comprised of a digitized video signal and a digitized audio signal;
 (c) partitioning one of said packetized data stream to
15 generate a video component and an audio component;
 (d) processing said digitized video signal and said digitized audio signal
 (e) processing and decompressing said video component of said packetized data stream, and processing said digitized video signal
20 to generate a video output signal;
 (f) processing and decompressing said audio component of said packetized data stream, and processing said digitized audio signal to generate an audio output signal; and
25 (g) delaying selectively the processing of the digitized audio signal to synchronize an audible audio signal with a displayable video signal;
 (h) transposing said video output signal to the displayable video signal and said audio output signal to the audible output signal.
30

9. The method of claim 8 wherein the step of delaying comprises providing said audible audio signal to an adjustable memory device.

35 10. The method of claim 9 further comprising the step of providing said audio output signal to a secondary audio processor (1609).